

Snake bite management in a toddler: a case report in Sumbawa Besar

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Snake bite is an often-neglected,¹ life-threatening emergency prevalent in rural areas of tropical countries such as Indonesia.² The WHO reported a worldwide incidence of 5 million snake bites per year, with 100,000-200,000 deaths.³ The incidence rate and likelihood of subsequent complications are higher in children than adults.⁴ According to the WHO, 35% of child deaths related to poisonous animal bites are attributable to snake bites and occur more frequently in boys than girls.⁵ In Indonesia, no national epidemiological data on snake bites in children is available, but the WHO estimated that 5-8 snake bite cases occur weekly in Lombok, West Nusa Tenggara.⁶

Lower limbs are the most common site for bites (72%), while facial bites are quite rare (10%).⁷ Bites involving children and/or the face are considered as severe envenomation and usually require antivenom at an appropriate dose and timing to be effective.⁸ Therefore, it is important that hospitals are equipped with life-saving intervention measures to optimize care and improve the chances of survival.⁹ Nevertheless, in developing countries, the use of antivenom is limited by the absence of standardized guidelines, scarcity/unavailability, and high cost.⁹ In Indonesia, the only antivenom, *serum antibisa ular* (SABU), is costly and difficult to obtain due to limited quantities, especially in rural areas. Furthermore, SABU is a polyvalent antivenom with low coverage, as it is only indicated for *Naja sputatrix*, *Bungarus fasciatus*, and *Agkistrodon rhodostoma*, despite the numerous other snake species endemic to Indonesia.² [Paediatr Indones. 2021;61:171-4 ; DOI: 10.14238/pi61.3.2021.171-4].

Keywords: snake bite; toddler; antivenom; Indonesia

The Case

A 1-year-old boy from a rural area of Sumbawa, West Nusa Tenggara, Indonesia, was admitted to our hospital with bilateral palpebral swelling and melena 26 hours after the snake bite occurred. He had been playing in the kitchen of the family's wooden farm house. The boy cried loudly in pain after the snake bite, and there was bleeding and swelling at the bite site. His mother tried to stop the bleeding by sucking the bite site, followed by topical application of an herbal concoction. The snake was green, white-lipped, had a brownish red-topped tail, and was an estimated 0.5-1 meter in size. The next day, the patient had melena and was unable to open his eyes due to progressive bilateral palpebral swelling. He was brought to a primary health care facility and referred to our hospital, located over 100 km away by road. He arrived around 26 hours after the snake bite. Upon admission, the child had a slight fever, no

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bleeding from his eyes, nostrils, or mouth, no seizures, no impaired consciousness, and no loss of vision or neurological manifestations.

During the examination, the child was conscious and cried loudly. He had stable hemodynamics with body temperature 37.7°C, pulse rate 120 beats/min, respiratory rate 40 breaths/min, blood pressure 100/60 mmHg, and 99% oxygen saturation. The child had good nutritional status, with 10 kg weight and 79 cm height. The forehead bite site had 3 fang marks, 1 cm superior to the eyebrows, with 2 x 3 cm of swelling. He had reddish bilateral palpebral swelling (**Figure 1**). He had no conjunctival bleeding and no jaundice. Pupillary and eyelid assessments for ptosis were not possible due to the severe palpebra swelling. His cardiopulmonary, neurological, and genitourinary systems were normal. The anal examination revealed blackish stool, but no sign of inflammation.

The patient had hemoglobin level of 5.3 g/dL and 20-minute whole blood clotting time (WBCT) did not reveal clotting. White blood cell count was normal, with differential count of 0.2% basophils, 0.5% eosinophils, 36.7% neutrophils, 51.7% lymphocytes, and 10.4% monocytes. Platelet count was $539 \times 10^3/\mu\text{L}$. His coagulation/hemostatic parameters were PT 400 seconds and aPTT 400 seconds. Serum electrolytes and urinalysis were normal. Stool examination showed erythrocytes using a microscopic

2-3/high power field, and no bacteria, protozoa, or parasites. Electrocardiography, as well as chest and abdomen radiology examinations were normal.

The patient was diagnosed with severe anemia on snake envenomation, with coagulopathy and bilateral palpebral edema. In the emergency room, he received 500 mg ceftriaxone every 24 h diluted on 50 mL NaCl 0.9% over 1 hour. Previously, he had received 5 mg dexamethasone intravenously and 120 mg paracetamol orally in the primary health care facility. The next day, the patient was transfused with 100 mL packed red cell (PRC) and given 2 vials of polyvalent antivenom (SABU) intravenously in 50 mL 0.9% NaCl over 1 hour. Vital signs were monitored for allergic reactions.

Twenty-four hours post admission, the palpebral edema had subsided, melena resolved, and there were no further patient symptoms. The antivenom administration had to be discontinued due to lack of stock. The nearest referral hospital with antivenom was on another island, over 12 hours away by road or ship. The patient's parents were clearly informed of the referral plan, but they refused. Blood examination could not be done due to blood clotting.

Two days after admission, the palpebral edema resolved and fang marks were reduced in size. His laboratory values improved, with hemoglobin 11.1 g/dL, platelet count $524 \times 10^3/\mu\text{L}$, PT 10.9 seconds,



Figure 1. Bilateral palpebral edema (yellow arrows) and fang marks (white arrows)

aPTT 23.8 seconds, and INR 1.01. After 4 days of hospitalization, the patient recovered and was discharged following total resolution of the swelling (Figure 2).

Discussion

Indonesia is one of the largest tropical countries, with many islands, a fast-growing agricultural sector, and a significant burden of snake bite cases.¹⁰ Forty-two snakebite cases were treated in Dr. Cipto Mangunkusumo National Referral Hospital, Jakarta, in 2004-2009. Of these, seventeen adult patients showed signs of envenomation.¹¹ More children than adults are victims of snake bites. In Cameroon, the age-adjusted morbidity from snake bites was 50 envenomations per 100,000 children aged less than 5 years, and 400 envenomations per 100,000 children aged 5-14 years.¹² Children are explorative and curious in nature, interacting with animals as they play outdoors in grass, fields, sand, water, or places where snakes can be easily found. In addition, a greater amount of toxin is injected per unit body mass due to children's small size, causing them to develop more severe adverse effects than adults.¹³ In addition, living in a wooden house surrounded with fields, grass, trees, and livestock (chickens or ducks) increases the risk of snake bites, as snakes live in such places.⁶

Snakes are not commonly known to bite the face.⁷ Facial bites increase the risk of early systemic envenoming due to the proximity to the heart, as compared to limb bites.¹⁴ Severity of snakebite envenomation can be driven by the following factors: young age, poor health status, bitten on critical areas (i.e., trunk, neck, or face), size and type of snake (e.g., large venomous snakes), types of bacteria in the snake's mouth, as well as immobilization and in exertion following a bite.¹⁴ Considering all these factors, our case was considered to be severe envenomation.

Identification of snake species is important to appropriately manage the bite. In Indonesia, there are two groups of snake species based on their biogeographical origins. The first group is similar to venomous snakes from the rest of Asia and is distributed across the West of Wallace's line (Sumatera, Java, Kalimantan, Sulawesi, and the lesser Sunda Island). The other group is more similar to snakes of Australo-Papuan origin and is located east of Wallace's line.² The WHO also divides snake species into two groups: category I has the highest medical importance as it causes mortality and morbidity, while category II has secondary medical importance.⁶ West Nusa Tenggara is included as part of the region west of Wallace's line, which consists of the snake families Elapidae and Viperidae. *Trimeresurus albolabris*

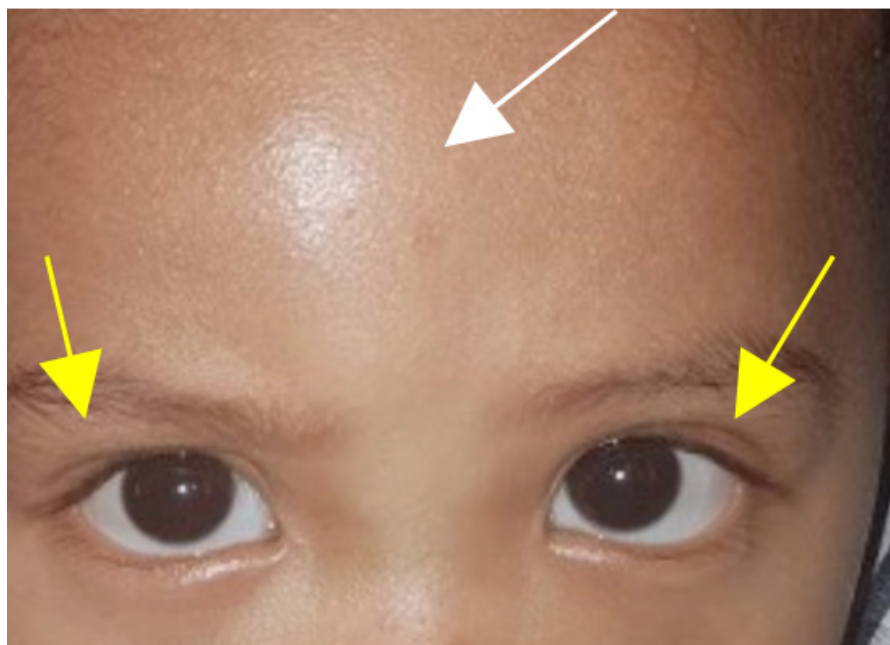


Figure 2. Resolution of palpebral edema (yellow arrows) and fang marks (white arrow)

insularis or the white-lipped pit viper, is a species from the family Viperidae and endemic to Sumbawa, West Nusa Tenggara. The characteristics of this species include pale green color, one-sided yellow color under the eyes, and brown tipped tail.⁶ The snake pathognomoncity was similar and confirmed by the patient's parents in this case.

Viper venom has remarkable procoagulant effects that activate factors II, IX, and X of the coagulation cascade and interfere with the platelet aggregation process and homeostasis between fibrinolysis and aggregation. This results in severe consumptive coagulopathy which occurs within 4-24 hours after a bite. Clinical manifestations of bleeding may vary from gingival bleeding, epistaxis, hematuria, hematemesis, or melena, to subarachnoid or intracerebral hemorrhage in severe cases.^{6,15} The positive results of 20 minute WBCT and presence of melena confirmed the coagulopathy in our case.

The main therapy for envenomation is prompt administration of potent, accurately-dosed antivenom, with an initial dose 2 vials (10 mL) administered intravenously at a slow rate (2 mL/minutes), or 2 vials in isotonic solution at a dilution of 5 mL/kg BW in 30-60 minutes. Further repeated doses of 2 vials in the next 6 hours can be repeated every 24 hours until a maximum of 80-100 mL (20 vials).⁷ Antivenom doses must not be reduced for children or small persons, since the amount of venom that needs to be neutralized is the same.¹⁶ General condition, vital signs, manifestations of bleeding, and laboratory testing for hemostasis should be observed after administration of the initial antivenom dose. If blood remains incoagulable after 6 hours and patients continue to bleed after 1-2 hours, or there are

deteriorating neurotoxic or cardiovascular signs after 1 hour, the initial antivenom dose should be repeated immediately.⁶ Alternatively, recommendations for the initial antivenom dose based on severity are shown in **Table 1**.¹⁶

In Indonesia, SABU (*Biosave*®), produced by *Biofarma* and made from equine serum, is the only snake antivenom available. *Biosave*® is a polyvalent antivenom indicated for neurotoxins produced by *Naja sputatrix* and *Bungarus fasciatus*, as well as hematoxin produced by *Agkistrodon rhodostoma*. This polyvalent antivenom is not effective for neutralizing venom produced by snake's endemic to East Indonesia, such as *Acanthopis antarticus*, *Xyuranus scutellatus*, *Pseudechis papuanus*, and *Enhydrina cystsa*, due to lack of cross-neutralization ability.² Nevertheless, to our knowledge, no studies about the effectiveness of SABU on other snake species in Indonesia have been done. *Trimeresurus albolabris insularis* as the suspected etiology of this case, was not covered by SABU, but the patient recovered well. A study reported that polyvalent antivenoms have cross-reactivity from different monoclonal antibodies that individually bind single toxins in different venoms.¹⁷ Therefore, antivenoms can possibly be used to treat snakebite envenomation from different snake species.

The barriers to antivenom use in Indonesia include stock shortages in rural areas, where the incidence is higher than in urban areas, and high cost (up to IDR 2 million or USD140 for a single vial). Other contributors to delayed antivenom treatment include distance to the nearest health facility with antivenom, cultural barriers influencing health-seeking behavior, lack of transportation, long walking distance which further delays treatment and

Table 1. Grading scale for severity of snake bites and its initial dose recommendation¹⁶

Degree of envenomation	Presentation	Treatment
0. None	Punctures or abrasions; some pain or tenderness at the bite	Local wound care, no antivenom
I. Mild	Pain, tenderness, edema at the bite; perioral paresthesia may be present	If antivenom is necessary, administer about five vials
II. Moderate	Pain, tenderness, erythema, edema beyond the area adjacent to the bite; often, systemic manifestations and mild coagulopathy	Administration of five to 15 vials of antivenom may be necessary
III. Severe	Intense pain and swelling of entire extremity, often with severe systemic signs and symptoms; coagulopathy	Administer at least 15 to 20 vials of antivenom
IV. Life threatening	Marked abnormal signs and symptoms; severe coagulopathy	Administer at least 25 vials of antivenom

accelerates venom effects, absence of cold-chain storage for antivenoms and other medicines in rural health facilities, usage restrictions that prevent antivenom from being administered in primary health centers, and forcing victims to look for treatment somewhere else, which requires family members to look for funds prior to treatment.¹⁸

Our patient was classified as having third degree envenomation based on clinical features, such as severe palpebral swelling and melena. The laboratory testing results showed severe anemia (Hb 5.3g/dL) and marked coagulopathy (WBCT did not clot, PT 400 seconds, and aPTT 400 seconds). According to the initial antivenom dose recommendation based on severity, our patient required at least 15 to 20 vials of antivenom.⁶ However, he only received 2 vials of antivenom due to stock shortage.

Supportive therapy was also an important component in snake bite management, which consisted of bed rest, wound dressing, reassurance, sedation, analgesics, prophylactic antibiotics, tetanus toxoid, steroids, intravenous fluids, wound debridement, limb elevation, and observation. Supportive therapy can be simple, safe, and effective in the treatment of snake bites, particularly for those without severe systemic poisoning. Our patient received a sub-optimal dose of antivenom, but complemented with a good supportive therapy, which altogether resulted in a favorable outcome.¹⁹

In conclusion, snake bites remain a public health problem in rural areas in Indonesia. National health policies should encourage the availability of antivenom in rural areas and increase community awareness about the prevention and treatment of snake bites. The effectiveness of SABU antivenom in our case remains unclear. Further studies are required to determine whether the outcome was driven by cross-neutralization, other supportive therapy, or a combination of both.

References

1. Sminkey L. World report on child injury prevention. *Inj Prev*. 2008;14:69. DOI: 10.1136/ip.2007.018143.
2. Warrel DA. Snake bite. *Lancet*. 2010;375:77-88. DOI: 10.1016/S0140-6736(09)61754-2.
3. World Health Organization. World report on child injury prevention. 1st ed. Geneva: World Health Organization; 2008. p. 123-38.
4. Niasari N, Latief A. Gigitan ular berbisa. *Sari Pediatri*. 2003;5:92-8. DOI: 10.14238/sp5.3.2003.92-8
5. Chippaux JP. Snake-bites: appraisal of the global situation. *Bull World Health Organ*. 1998;76:515-24. Available from: <https://apps.who.int/iris/handle/10665/56029>.
6. WHO Guidelines for the management of snakebites. 2nd ed. Geneva: World Health Organization; 2016. p. 75-104.
7. Cavazos MEDO, Garza CT, Guajardo-Rodríguez G, Hernández-Montelongo BA, Montes-Tapia FF. Snake bites in pediatric patients, a current view. In: Özdemir Ö, editor. *Complementary pediatrics*. 1st ed. Croatia: Intech; 2012. p. 123-36.
8. Habib AG. Public health aspects of snakebite care in West Africa: perspectives from Nigeria. *J Venom Anim Toxins Incl Trop Dis*. 2013;19:27. DOI: 10.1186/1678-9199-19-27.
9. Ahmed SM, Ahmed M, Nadeem A, Mahajan J, Choudhary A, Pal J. Emergency treatment of a snake bite: pearls from literature. *J Emerg Trauma Shock*. 2008;1:97-105. DOI: 10.4103/0974-2700.43190
10. Silva A, Marikar F, Murugananthan A, Agampodi S. Awareness and perceptions on prevention, first aid and treatment of snakebites among Sri Lankan farmers: a knowledge practice mismatch? *J Occup Med Toxicol*. 2014;9:20. DOI: 10.1186/1745-6673-9-20.
11. Adiwinata R, Nelwan EJ. Snakebite in Indonesia. *Acta Med Indones*. 2015;47:358-65. PMID: 26932707.
12. Chippaux JP, Rage-Andrieux V, Le Mener-Delore V, Charrondiere M, Sagot P, Lang J. Epidemiology of snake envenomations in northern Cameroon. *Bull Soc Pathol Exot*. 2002;95:184-7. PMID: 12404867.
13. Kreisfeld R, Winkel KD, Harrison J. Hospitalisations due to animal and plant injury in Australia 2000/01–2001/2. 1st ed. Canberra: Research Centre for Injury Studies, Australian Institute of Health and Welfare; 2007. p. 123-42.
14. Micheal GC, Aliyu I, Grema BA. Viper bite on the neck following a fight. *Sudan Med Monit*. 2015;10:133-6. DOI: 10.4103/1858-5000.171865.
15. Fatima LD, Fatah C. Pathophysiological and pharmacological effects of snake venom components: molecular targets. *J Clin Toxicol*. 2014;4:1-9. DOI: 10.4172/2161-0495.190.
16. Juckett G, Hancox JG. Venomous snakebites in the United States: management review and update. *Am Fam Physician*. 2002;65:1367–74. PMID: 11996419.
17. Ledsgaard L, Jenkins TP, Davidsen K, Krause KE, Martos-Esteban, Engmark M, et al. Antibody cross-reactivity in antivenom research. *Toxins*. 2018;10:393. DOI: 10.3390/toxins10100393.

18. World Health Organization. Snakebite envenoming. [Internet]. [cited 2019 December 07] Available from: <https://www.who.int/snakebites/treatment/en/>.
19. Wangoda R, Warmon B, Kisige M. Snakebite management: experiences from Gulu Regional Hospital Uganda. *East Cent Afr J Surg*. 2004;9:82-6. Available from: <https://www.ajol.info/index.php/ecaajs/article/view/137289>.